# Complete Summary

## GUIDELINE TITLE

Care and maintenance to reduce vascular access complications.

## BIBLIOGRAPHIC SOURCE(S)

Registered Nurses Association of Ontario (RNAO). Care and maintenance to reduce vascular access complications. Toronto (ON): Registered Nurses Association of Ontario (RNAO); 2005 Apr. 88 p. [112 references]

## GUIDELINE STATUS

This is the current release of the guideline.

## COMPLETE SUMMARY CONTENT



## SCOPE

### DISEASE/CONDITION(S)

Vascular access complications

### GUIDELINE CATEGORY

Management
Prevention

### CLINICAL SPECIALTY

Cardiology
Critical Care
Nursing
Pulmonary Medicine

## INTENDED USERS

Advanced Practice Nurses
Nurses

## GUIDELINE OBJECTIVE(S)

The purpose of this guideline is to provide evidence-based support for nurses related to the care and maintenance of vascular access devices, client education, and safety.

Specific clinical questions to be addressed include:

- How can the risk of complications be minimized through appropriate care and maintenance of vascular access devices?
- What strategies should be used for client and staff education to address the care and maintenance of vascular access devices?

## TARGET POPULATION

Patient with central venous access devices (CVAD) and peripheral venous access devices (PVAD)

Note: This guideline does not include recommendations related to the care of clients requiring infusion therapy through the following devices: arterial lines, hemodialysis catheters, pulmonary artery lines, pheresis lines, epidural catheters, pressure monitoring devices, umbilical vein, femoral catheters, and/or intraosseous lines.

## INTERVENTIONS AND PRACTICES CONSIDERED

### Prevention

1. Ensure proper selection of peripheral insertion site
2. Ensure the use of routine practices and precautions to prevent the spread of infection including hand hygiene, assessment of client risk factors, screening, hazard or risk reduction, and application of personal protective equipment (PPE)
3. Perform catheter site care using aseptic techniques
4. Confirm central venous access device (CVAD) tip placement prior to therapy delivery
5. Consider type of dressing, frequency of dressing change, and client choice, tolerance and lifestyle when selecting and changing VAD dressings
6. Stabilize VAD with tape, sutures, securement device
7. Maintain patency using locking and flushing techniques
8. Consider risk factors including client, device, and infusion factors
9. Assess catheter occlusion
10. Minimize CVAD access
11. Change all add-on devices at least every 72 hours

### Management

1. Document condition of VAD

2. Provide client education

### MAJOR OUTCOMES CONSIDERED

- Rates of completion of therapy
- Complication rates
- Client satisfaction

## METHODOLOGY

### METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Searches of Electronic Databases
Searches of Unpublished Data

### DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

A database search for existing infusion therapy guidelines was conducted by a university health sciences library. After the scope of the guideline was established, a search of the MEDLINE, Embase, and CINAHL databases for guidelines and articles published from January 1996 to November 2004 was conducted using the following search terms: "catheterization, peripheral/ or catheterization, peripheral central venous," "central venous catheters/or peripherally inserted central catheters," "nursing role," "nursing care," "vascular access devices/or catheters," "vascular/or vascular access devices," "implantable," "catheter-related complications," "equipment contamination," "equipment safety," "catheter care, vascular," "catheter occlusion," "catheter-related infections," "nursing assessment," "practice guideline(s)," "clinical practice guideline(s)," "standards," "consensus statement(s)," "consensus," "evidence based guidelines," and "best practice guidelines." This search generated numerous abstracts which were then reviewed by a masters prepared Research Assistant assigned to the project for the purposes of selecting articles based on inclusion criteria that related to the clinical questions. The Research Assistant conducted a quality appraisal of the selected articles and summarized the studies according to the following:

- Study type
- Sample (number of subjects/characteristics)
- Intervention used in the study
- Measures used in the study
- Findings
- Limitations

This summary was distributed to the panel.

One individual searched an established list of 53 Web sites for content related to the topic area. This list of sites, reviewed and updated in July 2003, was compiled based on existing knowledge of evidence-based practice Web sites, known guideline developers and recommendations from the literature. Presence or absence of guidelines was noted for each site searched as well as date searched. The Web sites at times did not house a guideline but directed to another Web site

or source for guideline retrieval. Guidelines were either downloaded if full versions were available or were ordered by phone/e-mail.

A Web site search for existing guidelines was conducted via the search engine "Google", using the search terms identified above. One individual conducted this search, noting the search term results, the Websites reviewed, date, and a summary of the findings. The search results were further critiqued by a second individual who identified guidelines and literature not previously retrieved.

Additionally, panel members were already in possession of a few of the identified guidelines. In some instances, a guideline was identified by panel members and not found through the previous search strategies. These were guidelines that were developed by local groups or specific professional associations.

This above search method revealed nine guidelines, several systematic reviews, and numerous articles related to care and maintenance of vascular access devices.

The final step in determining whether the clinical practice guideline would be critically appraised was to have two individuals screen the guidelines based on the following criteria. These criteria were determined by panel consensus:

- Guideline was in English
- Guideline was dated no earlier than 2000
- Guideline was strictly about the topic area
- Guideline was evidence based
- Guideline was available and accessible for retrieval

The results of the search strategy and the decision to critically appraise identified guidelines are itemized in the original guideline document. Nine guidelines met the screening criteria and were critically appraised using the Appraisal of Guidelines for Research and Evaluation (AGREE) Instrument (AGREE Collaboration, 2001). This process yielded a decision to work primarily with five existing guidelines.

## NUMBER OF SOURCE DOCUMENTS

Not stated

## METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

## RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Levels of Evidence

Ia Evidence obtained from meta-analysis or systematic review of randomized controlled trials

Ib Evidence obtained from at least one randomized controlled trial

IIa Evidence obtained from at least one well-designed controlled study without randomization

IIb Evidence obtained from at least one other type of well-designed quasi-experimental study without randomization

III Evidence obtained from well-designed non-experimental descriptive studies, such as comparative studies, correlation studies, and case studies

IV Evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities

## METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review with Evidence Tables

## DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

## METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

## DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

In June of 2004, a panel of nurses with expertise in vascular access from institutional, community, educational, and industry settings (including vendor companies) was convened under the auspices of the Registered Nurses Association of Ontario (RNAO). At the outset, the panel established the scope of the guideline through a process of discussion and consensus. It was decided to focus on the care and maintenance of vascular access in order to reduce complications for the client.

The panel members divided into subgroups to undergo specific activities using the short-listed guidelines, other literature, and additional resources for the purpose of drafting recommendations. This process yielded a draft set of recommendations. The panel members as a whole reviewed the recommendations, discussed gaps, available evidence, and came to consensus on a draft guideline.

## RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

## COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

### METHOD OF GUIDELINE VALIDATION

External Peer Review
Internal Peer Review

### DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

This draft was submitted to a set of external stakeholders for review and feedback. An acknowledgement of these reviewers is provided at the front of the original guideline document. Stakeholders represented various health care disciplines, clients and families, as well as professional associations. External stakeholders were provided with specific questions for comment, as well as the opportunity to give overall feedback and general impressions. The results were compiled and reviewed by the development panel. Discussion and consensus resulted in revisions to the draft document prior to publication.

## RECOMMENDATIONS

### MAJOR RECOMMENDATIONS

The levels of evidence supporting the recommendations (Ia, Ib, IIa, IIb, III, IV) are defined at the end of the "Major Recommendations" field.

Practice Recommendations

Site Selection: Peripheral

Recommendation 1.0

Nurses will select a peripheral insertion site appropriate for the required therapy and with the least risk of complication.

(Level of Evidence = IV)

Site and Catheter Care: Safety / Infection Prevention Control

Recommendation 2.0

Nurses will prevent the spread of infection by following routine practices and using additional precautions.

(Level of Evidence = IV)

Skin Antisepsis

Recommendation 3.0

Nurses will consider the following factors when performing catheter site care using aseptic technique:

- Catheter material (composition)
- Antiseptic solution
- Client's tolerance (skin integrity, allergies, pain, sensitivity, and skin reaction)

(Level of Evidence = IV)

### Tip Placement

#### Recommendation 4.0

Nurses will not use the central venous access device (CVAD) until tip placement has been confirmed.

(Level of Evidence = IV)

### Dressings

#### Recommendation 5.0

Nurses will consider the following factors when selecting and changing venous access device (VAD) dressings:

- Type of dressing
- Frequency of dressing changes
- Client's choice, tolerance, and lifestyle

(Level of Evidence = IV)

### Securement

#### Recommendation 6.0

Nurses must stabilize the VAD in order to:

- Promote assessment and monitoring of the vascular access site
- Facilitate delivery of prescribed therapy
- Prevent dislodgement, migration, or catheter damage

(Level of Evidence = III)

### Patency/Flushing/Locking

#### Recommendation 7.0

Nurses will maintain catheter patency using flushing and locking techniques.

(Level of Evidence = IV)

Recommendation 8.0

Nurses will know what client factors, device characteristics, and infusate factors can contribute to catheter occlusion in order to ensure catheter patency for the duration of the therapy.

(Level of Evidence = IV)

Occlusion

Recommendation 9.0

Nurses will assess and evaluate vascular access devices for occlusion in order to facilitate treatment and improve client outcomes.

(Level of Evidence = IV)

Blood Withdrawal

Recommendation 10.0

Nurses will minimize accessing the central venous access device (CVAD) in order to reduce the risk of infection and nosocomial blood loss.

(Level of Evidence = IV)

Add-Ons

Recommendation 11.0

Nurses will change all add-on devices a minimum of every 72 hours

(Level of Evidence = IV)

Documentation

Recommendation 12.0

Nurses will document the condition of vascular access devices including:

- The insertion process
- Site assessment
- Functionality

(Level of Evidence = III)

Client Education

Recommendation 13.0

Nurses will help clients to attain the highest level of independence through client education.

(Level of Evidence = IV)

Education Recommendations

Recommendation 14.0

The principles and practice of infusion therapy should be included in the basic education curriculum, be available as continuing education, be provided in orientation to new employees, and be made available through continuing professional development opportunities.

(Level of Evidence = IV)

Recommendation 15.0

Schools of Nursing will include Registered Nurses Association of Ontario (RNAO) best practice guidelines Assessment and Device Selection for Vascular Access and Care and Maintenance to Reduce Vascular Access Complications as reference material for core curricula.

(Level of Evidence = IV)

Organization & Policy Recommendations

Recommendation 16.0

Health care organizations will have policies that address components of vascular access therapy in order to ensure positive client outcomes.

(Level of Evidence = IV)

Recommendation 17.0

Health care organizations, in collaboration with their infection control teams, will monitor complications of infusion therapy and use data to employ risk reduction strategies.

(Level of Evidence = IV)

Recommendation 18.0

Health care organizations will implement the use of safety engineered devices and equipment to reduce the nurse's risk of sharps injuries that can lead to blood borne diseases. The organization's risk management program will monitor assessment of these practices and incidents.

(Level of Evidence = III)

Recommendation 19.0

Health care organizations have access to infusion therapy nursing expertise to support optimal vascular access outcomes.

(Level of Evidence = III)

Recommendation 20.0

Nursing best practice guidelines can be successfully implemented only where there are adequate planning, resources, organizational and administrative support, as well as appropriate facilitation. Organizations may wish to develop a plan for implementation that includes:

- An assessment of organizational readiness and barriers to education.
- Involvement of all members (whether in a direct or indirect supportive function) who will contribute to the implementation process.
- Dedication of a qualified individual to provide the support needed for the education and implementation process.
- Ongoing opportunities for discussion and education to reinforce the importance of best practices.
- Opportunities for reflection on personal and organizational experience in implementing guidelines.

In this regard, RNAO (through a panel of nurses, researchers, and administrators) has developed the Toolkit: Implementation of Clinical Practice Guidelines based on available evidence, theoretical perspectives, and consensus. The Toolkit is recommended for guiding the implementation of the RNAO guideline Care and Maintenance to Reduce Vascular Access Complications.

(Level of Evidence = IV)

Definitions:

Levels of Evidence

Ia Evidence obtained from meta-analysis or systematic review of randomized controlled trials

Ib Evidence obtained from at least one randomized controlled trial

IIa Evidence obtained from at least one well-designed controlled study without randomization

IIb Evidence obtained from at least one other type of well-designed quasi-experimental study without randomization

III Evidence obtained from well-designed non-experimental descriptive studies, such as comparative studies, correlation studies, and case studies

IV Evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities

### CLINICAL ALGORITHM(S)

An algorithm is provided in the original guideline document for troubleshooting catheter occlusion.

## EVIDENCE SUPPORTING THE RECOMMENDATIONS

### TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of evidence is identified and graded for each recommendation (see "Major Recommendations" field).

## BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

### POTENTIAL BENEFITS

- The desired clinical goal is positive client outcomes as evidenced by completion of therapy, absence of complications, and client satisfaction with delivery of care.
- Nurses, other healthcare professionals, and administrators who are leading and facilitating practice changes will find this document valuable for the development of policies, procedures, protocols, educations programs, assessments, and documentation tools.

### POTENTIAL HARMS

- Antiseptics should remain on the insertion site and be allowed to air dry before catheter insertion and/or dressing change to prevent skin breakdown
- Excessive flushing pressure can cause clots to be dislodged, catheter separation, and/or catheter rupture. In order to reduce the potential of excessive pressure, it is generally recommended that a 10 mL (or larger) syringe be used for flushing
- Heparin has been associated with iatrogenic hemorrhage (a life-threatening reaction to heparin), heparin induced thrombocytopenia (HIT), drug interactions and inaccurate blood results

## QUALIFYING STATEMENTS

### QUALIFYING STATEMENTS

- This nursing best practice guideline is a comprehensive document providing resources necessary for the support of evidence-based nursing practice. The document needs to be reviewed and applied, based on the specific needs of the organization or practice setting/environment, as well as the needs and wishes of the client. Guidelines should not be applied in a "cookbook" fashion but used as a tool to assist in decision making for individualized client care, as

well as ensuring that appropriate structures and supports are in place to provide the best possible care.

- These best practice guidelines are related only to nursing practice and not intended to take into account fiscal efficiencies. These guidelines are not binding for nurses and their use should be flexible to accommodate client/family wishes and local circumstances. They neither constitute a liability nor discharge from liability. While every effort has been made to ensure the accuracy of the contents at the time of publication, neither the authors nor the Registered Nurses Association of Ontario (RNAO) give any guarantee as to the accuracy of the information contained in them nor accept any liability, with respect to loss, damage, injury or expense arising from any such errors or omission in the contents of this work. Any reference throughout the document to specific pharmaceutical products as examples does not imply endorsement of any of these products.
- It is acknowledged that the individual competencies of nurses varies between nurses and across categories of nursing professionals (registered practical nurses [RPNs] and registered nurses [RNs]) and are based on knowledge, skills, attitudes, critical analysis and decision making which are enhanced over time by experience and education. It is expected that individual nurses will perform only those aspects of care and maintenance for vascular access devices for which they have received appropriate education and have experience. It is expected that nurses will seek appropriate consultation in instances where the client's care needs surpass the nurse's ability to act independently. It is acknowledged that effective healthcare depends on a coordinated health care team approach incorporating ongoing communication between health professionals and clients, ever mindful of the personal choices and unique needs of each individual client.

## IMPLEMENTATION OF THE GUIDELINE

### DESCRIPTION OF IMPLEMENTATION STRATEGY

Best practice guidelines can only be successfully implemented if there are: adequate planning, resources, organizational and administrative support, as well as appropriate facilitation. Registered Nurses Association of Ontario (RNAO), through a panel of nurses, researchers and administrators, has developed the Toolkit: Implementation of Clinical Practice Guidelines based on available evidence, theoretical perspectives, and consensus. The Toolkit is recommended for guiding the implementation of any clinical practice guideline in a healthcare organization.

The Toolkit provides step-by-step directions to individuals and groups involved in planning, coordinating, and facilitating the guideline implementation. Specifically, the Toolkit addresses the following key steps in implementing a guideline:

1. Identifying a well-developed, evidence-based clinical practice guideline
2. Identification, assessment and engagement of stakeholders
3. Assessment of environmental readiness for guideline implementation
4. Identifying and planning evidence-based implementation strategies
5. Planning and implementing evaluation
6. Identifying and securing required resources for implementation

Implementing guidelines in practice that result in successful practice changes and positive clinical impact is a complex undertaking. The Toolkit is one key resource for managing this process.

### Evaluation/Monitoring

Organizations implementing the recommendations in this nursing best practice guideline are recommended to consider how the implementation and its impact will be monitored and evaluated. A table in the original guideline document, based on a framework outlined in the RNAO Toolkit: Implementation of Clinical Practice Guidelines (2002), illustrates some indicators for monitoring and evaluation.

### Implementation Strategies

The RNAO and the guideline development panel have compiled a list of implementation strategies to assist healthcare organizations or healthcare disciplines who are interested in implementing this guideline. See the original guideline document for a summary of strategies.

### IMPLEMENTATION TOOLS

Chart Documentation/Checklists/Forms
Clinical Algorithm
Quick Reference Guides/Physician Guides
Resources
Tool Kits

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

## INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

### IOM CARE NEED

Getting Better
Staying Healthy

### IOM DOMAIN

Effectiveness
Patient-centeredness
Safety

## IDENTIFYING INFORMATION AND AVAILABILITY

### BIBLIOGRAPHIC SOURCE(S)

Registered Nurses Association of Ontario (RNAO). Care and maintenance to reduce vascular access complications. Toronto (ON): Registered Nurses Association of Ontario (RNAO); 2005 Apr. 88 p. [112 references]

## ADAPTATION

The Registered Nurses Association of Ontario (RNAO) panel selected the following guidelines to adapt and modify for the current guideline:

- Centers for Disease Control and Prevention (CDC) (2002). Guidelines for the prevention of intravascular catheter-related infections. Morbidity and Mortality Weekly Report (MMWR) 51 (No. RR-10), 1-29.
- Department of Health (DH) (2001a). Guidelines for preventing infections associated with the insertion and maintenance of central venous catheters: Introduction. Journal of Hospital Infection 47, S13-S19.
- Department of Health (DH) (2001b). Guidelines for preventing infections associated with the insertion and maintenance of central venous catheters. Journal of Hospital Infection 47, S47-S67.
- Evidence-Based Practice in Infection Control (EPIC) (2001a). The EPIC project: Developing national evidence-based guidelines for preventing hospital-acquired infections. National evidence-based guidelines for preventing hospital-acquired infections associated with the use of central venous catheters. Technical report part A.
- Evidence-Based Practice in Infection Control (EPIC) (2001b). The EPIC project: Developing national evidence-based guidelines for preventing hospital-acquired infections. National evidence-based guidelines for preventing hospital-acquired infections associated with the use of central venous catheters. Technical report part B.
- Intravenous Nurses Society (INS) (2000). Infusion nursing: Standards of practice. Journal of Intravenous Nursing, 23, S1-S88.
- Royal College of Nursing (RCN) (2003). Standards for infusion therapy. London: Author

## DATE RELEASED

2005 Apr

## GUIDELINE DEVELOPER(S)

Registered Nurses Association of Ontario - Professional Association

## SOURCE(S) OF FUNDING

Funding was provided by the Ontario Ministry of Health and Long Term Care.

## GUIDELINE COMMITTEE

Not stated

## COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Guideline Development Panel Members:

Susanne Nelson, RN, BScN, MN (C), CINA(C)
Team Leader
Nurse Coordinator -- Vascular Access
University Health Network
Toronto, Ontario

Lisa Valentine, RN, BScN, MN
Team Facilitator
Practice Consultant
College of Nurses of Ontario
Toronto, Ontario

Sharon Armes, RN, CINA(C)
Clinical Education Coordinator
Bard Canada Inc.
Mississauga, Ontario

Adrienne Austin, RN, BScN, CINA(C)
Clinical Manager, Vascular Access Therapy
Hamilton Health Sciences Centre
Hamilton, Ontario

Nan Cleator, RN, CINA(C)
National Clinical Consultant
Victorian Order of Nurses -- Canada
Huntsville, Ontario

Lina D'Onofrio, RN, MN
Clinical Nurse Specialist
Transfusion Services
University Health Network
Toronto, Ontario

Cynthia Giff, RN
Nursing Director Medical/Surgical Units
Brockville General Hospital
Brockville, Ontario

Susanne Gomes, RN, BScN
Oncology Nurse
Thunder Bay Regional Health Sciences Centre
Thunder Bay, Ontario

Glenda Hicks, RN, BScN
Nurse Educator/Clinician
Critical Care Program
St. Joseph's Heath Centre
Sudbury, Ontario

Kris Paton, RN, CINA(C)
Clinical Leader, Vascular Access Therapy
Hamilton Health Sciences Centre
Hamilton, Ontario

Sharon Rodkin, RN, CINA(C)
Manager, Clinical Consulting
Baxter Corporation
Mississauga, Ontario

Jane M. Schouten, RN, BScN, MBA
Program Staff -- Facilitator
Nursing Best Practice Guidelines Program
Registered Nurses Association of Ontario
Toronto, Ontario

## FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Declarations of interest and confidentiality were made by all members of the guideline development panel. Further details are available from the Registered Nurses Association of Ontario.

## GUIDELINE STATUS

This is the current release of the guideline.

## GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the Registered Nurses Association of Ontario (RNAO) Web site.

Print copies: Available from the Registered Nurses Association of Ontario (RNAO), Nursing Best Practice Guidelines Project, 158 Pearl Street, Toronto, Ontario M5H 1L3.

## AVAILABILITY OF COMPANION DOCUMENTS

The following are available:

- Summary of recommendations. Care and maintenance to reduce vascular access complications. Toronto (ON): Registered Nurses Association of Ontario (RNAO); 2005 Apr. 3 p. Electronic copies: Available in Portable Document Format (PDF) from the Registered Association of Ontario (RNAO) Web site.
- Toolkit: implementation of clinical practice guidelines. Toronto (ON): Registered Nurses Association of Ontario (RNAO); 2002 Mar. 88 p. Electronic copies: Available in Portable Document Format (PDF) from the Registered Association of Ontario (RNAO) Web site.
- Various implementation tools, including illustrations of vein anatomy and blood flow rates for peripheral site selection and tip placement for tunneled catheter, and a data collection tool for central venous access devices, are

included in the appendices to the original guideline document, available from the Registered Nurses Association of Ontario (RNAO) Web site.

Print copies: Available from the Registered Nurses Association of Ontario (RNAO), Nursing Best Practice Guidelines Project, 158 Pearl Street, Toronto, Ontario M5H 1L3.

### PATIENT RESOURCES

None available

### NGC STATUS

This NGC summary was completed by ECRI on July 12, 2005. The information was verified by the guideline developer on July 18, 2005.

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